REMARKS

Claims 1-26 are pending in the case. The Examiner issued a restriction requirement under 35 U.S.C. §121 designating claims 1-12 as invention I and claims 13-26 as invention II. The Examiner provisionally rejected claims 1-12 under non-statutory double patenting in view of claims 1-33 in copending Patent Application No. 09/919,280 in view of U.S. Patent Application Publication No. 2001/0013997 to Sasaki et al. (hereinafter "Sasaki"). The Examiner objected to claims 7, 10, and 12 for informalities. The Examiner rejected claims 7, 8, and 12 under 35 U.S.C. §112, second paragraph as indefinite. The Examiner rejected claims 1-9 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0024780 to Mao et al. (hereinafter "Mao") in view of Sasaki. The Examiner rejected claims 10 and 11 under 35 U.S.C. §103(a) as being unpatentable in view of Mao, Sasaki, and U.S. Patent Application Publication No. 2002/0054463 to Mukoyamma et al. (hereinafter "Mukoyamma"). The Examiner rejected claim 12 under 35 U.S.C. §103(a) as being unpatentable in view of Mao, Sasaki, and U.S. Patent Application Publication No. 2001/0014412 to Jongill et al. (hereinafter "Jongill"). The amended claims are believed to be in condition for allowance, and applicant respectfully requests the prompt allowance of claims 1-12.

RESTRICTION REQUIREMENT

On January 16, 2003, Applicant's attorney Brian C. Kunzler made a provisional election, with traverse, to prosecute the invention of Group I, claims 1-12, in a telephone conference with the Examiner. Applicant respectfully requests that the restriction requirement be reconsidered for the following reasons.

Claim 13 recites "forming a cap layer disposed to one side of the sensing layers by deposition and *in-situ* oxidation of a metallic film." The Examiner asserts that the product recited in claim 1 can be made by a materially different process. As examples, the Examiner cites the sputtering of an oxide layer, utilization of oxygen plasma, or moving the system to an oxygen-containing atmosphere.

Applicant respectfully asserts that the product as claimed in claim 1 cannot be made by a materially different process from that claimed in claim 13. "[D]efining the product in terms of a

process by which it is made is nothing more than a permissible technique that applicant may use to define the invention." MPEP §806.05(f).

As highlighted in the specification, one challenge in the art is to reduce the thickness of the spin-valve sensor. See, Specification page 4, lines 7-12. This means the thickness of the gap layers must be reduced. By "forming a [g]ap layer disposed to one side of the sensing layer by deposition and *in-situ* oxidation of a metal film," a very thin layer is formed with a high oxidation density and thus high insulation properties. Forming a gap layer by deposition and *in-situ* oxidation is materially different from sputtering an oxide layer, using oxygen plasma, or moving the system to an oxygen-containing atmosphere. The deposited gap layer comprises very pure metal that is fully oxidized to provide high insulation qualities while maintaining a very small thickness of about ten angstroms.

Sputtering an oxide layer involves sputtering a metal oxide to form a thick oxide layer of about 100 angstroms. The resulting layer is too thick for many current semiconductor processes. Similarly, forming an oxide layer using plasma forms an oxide layer having a low oxidation density. To overcome the low oxidation density, the oxide layers must be stacked, which increases the thickness of conventional gap layers to about 1000 angstroms. In addition, moving the material into the presence of oxygen may introduce contaminants that affect the operation of the gap layers.

In contrast, claim 13 claims depositing a metal film and *in-situ* oxidation. As described in the specification, this means that the metal film is deposited and then the deposited layer is exposed in-place, *in-situ* (without movement to an oxygen-containing atmosphere), to oxygen to form a cap layer or a gap layer. *See*, Specification, page 6, lines 12-24.

Applicant asserts that this process is materially different from sputtering an oxide layer, using oxygen plasma, or moving the system to an oxygen-containing atmosphere as suggested by the Examiner. Consequently, Applicant requests reconsideration of the restriction requirement.

In order to advance prosecution, the Applicant hereby affirms the provisional election, with traverse, to prosecute the invention of Group I, claims 1-12.

NON-STATUTORY DOUBLE PATENTING

Applicant is filing with this paper a terminal disclaimer. Applicant respectfully asserts that the terminal disclaimer properly overcomes the double-patenting rejections cited by the Examiner.

CLAIM OBJECTIONS

The Examiner objected to claim 7, 10, and 12 for informalities. Applicant has amended claim 7, 10, and 12 to overcome the objections. Applicant submits that these amendments clarify claim 7, 10, and 12 without changing the scope of the originally filed claim or the range of equivalents for these claims. Applicant asserts that amended claims 7, 10, and 12 are in condition for allowance.

REJECTION OF CLAIMS 7, 8, AND 12 UNDER 35 U.S.C. §112, SECOND PARAGRAPH

The Examiner rejected claims 7, 8, and 12 under 35 USC §112, 2nd paragraph as indefinite due to the phrase "between about." The words of the claim must be given their "plain meaning" unless they are defined in the specification. MPEP §2111.01. Applicant respectfully asserts that claims 7, 8, and 12 allow those of skill in the art to ascertain the full scope of the claims.

Claims 7, 8, and 12 all refer to ranges that involve Angstroms (Å). Angstroms are a very small and precise unit of measure. One angstrom is one ten-billionth (1/10,000,000,000) of a meter. Those of skill in the art of spin-valve sensor technology are scientists that recognize the importance of precision in measurements for components of such small size. Often measurements of this magnitude involve decimal notation such that the measurement is as precise as possible.

Two measurements of a component measured in angstroms may, however, differ due to an error made by the measuring device or person taking the measurement. Therefore, due to the possibility of these kinds of measurement errors for such small-scale components, those of skill in the art recognize that forming layers that have exact measurements in angstrom units may be very difficult. Accordingly, those of skill in the art accept that defining the metes and bounds of size ranges for components may include a reasonable variation.

Furthermore, the term "between" is definite. The term "about" means "reasonably close to." *See*, http://www.m-w.com/cgi-bin/dictionary. The term "about" is definite "[if] infringement could clearly be assessed..." MPEP §2173.05(b)A. Infringement can be clearly assessed because those of skill in the art accept that measurement in angstroms may in fact be exactly the same size, but have a reasonable variation due to an error caused by the user or equipment and the small magnitude involved.

Applicant respectfully asserts that claims to ranges between about X angstroms and about Y angstroms are definite. Those of skill in the art recognize the term "about" to mean a reasonable variation on either side of the listed number of angstroms. Therefore, applicant respectfully asserts that claims 7, 8, and 12 are definite under 35 U.S.C. §112.

REJECTION OF CLAIMS 1-9 UNDER 35 U.S.C. §103(a)

The Examiner rejected claims 1-9 in view of Mao and Sasaki. This rejection is respectfully traversed.

The Examiner bears the initial burden of establishing a *prima facie* case of obviousness. *See* MPEP § 2142. To establish a *prima facie* case of obviousness, the combination of the prior art references must teach or suggest all the claim limitations. MPEP § 2142.

Applicant asserts that the combination of Moa and Sasaki fails to teach or suggest all the claim limitations of the independent claim 1. Specifically, Sasaki fails to teach or disclose "a gap layer disposed to one side of the antiferromagnetic pinning layer, the gap layer comprising a plurality of oxidized metallic films" as recited in claim 1. Applicant respectfully asserts that the metallic layers of the claimed invention are fundamentally different from the metallic layers disclosed in Sasaki.

In the claimed invention, the gap layer is formed by a process of forming successive metallic layers that are *in-situ* oxidized. *See*, Specification, page 6, lines 13-20. Pure Al is deposited using Physical Vapor Deposition (PVD). PVD sputters a very thin layer within a vacuum, about eight angstroms, of pure Al on a target surface. *See,* Specification, page 6, lines 13-20. The target surface may be a cap layer or a shield layer. The thin layer of Al is then *in-situ* oxidized such that the thickness is about ten angstroms.

Forming the thin oxidized metal Al using PVD provides a substantially pure layer of metal. The metal may be 99.9999% Al. The PVD process is conducted in a vacuum substantially void of any other particles or contaminants. The pure metal fully oxidizes when the film is exposed to oxygen. *See,* Specification, page 6, lines 24-25. Those of skill in the art will recognize that full oxidation comprises oxidation throughout the metal film. A fully oxidized metal film provides a more dense oxidation than may be formed using conventional metal oxides. Full oxidation is possible because the metal layer is so thin. The purity of the metal film and full oxidation of the metal contribute to the film comprising a minimal number of pinholes. To provide a suitable gap layer of the desired thickness, a plurality of metal films are formed by repeating the PVD sputtering and *in-situ* oxidation.

High density oxidation gap layers allows for gap layers of a very small thickness, about 100 angstroms, that still provide the level of insulation necessary to avoid shunting between adjacent layers. A smaller gap layer allows the overall size of hard disk heads to be smaller. Consequently, more data can be stored in a smaller space.

In contrast, Sasaki teaches metallic films that are physically very different from those of the claimed invention. In Sasaki, the metallic films are metal oxides, where in the claimed invention, the metallic films are oxidized metal films. Although, the difference may appear subtle on the surface, the physical properties are very different, as discussed below.

In Sasaki, metallic films are formed using Low Pressure Chemical Vapor Deposition (LPCVD or CVD). *See,* Sasaki paragraph 0076. LPCVD involves forming of alumina films, which is aluminum oxide, by a chemical reaction between two gases that are intermittently injected where one gas may be H_2O, N_2O or H_2O_2; the other may be $Al(CH_3)_3$ or Al_2Cl_3. *See,* Sasaki paragraph 0047. The gases chemically react to form the metal oxide film. In other words, a metal oxide is formed and deposited at substantially the same time. In the claimed invention, the oxidation occurs after the pure metal is sputter deposited.

Sasaki seems to suggest forming a gap layer of alumina by sputtering. *See,* Sasaki paragraph 0011. The aluminum oxide is sputtered onto a substrate. The thickness of the gap layer taught by Sasaki, however, is necessarily ten times thicker than that of the claimed

invention. The larger size restricts the size of the overall spin-valve sensor. In addition, the aluminum oxide may include contaminants.

Metal oxide films, such as those taught by Sasaki, typically also include undesirable chemical elements and other contaminates such as N, Al, or Cl. This is particularly so in light of the fact that there is no teaching or suggestion in Sasaki that the CVD is performed in a vacuum. Such contaminates can cause the gap layer to short.

Additionally, CVD metal oxide layers have a lower oxidation density than PVD oxidized metallic layers of the claimed invention. This results in a much higher possibility that the CVD metal oxide layers will short than the PVD oxidized metal layers of the claimed invention. To prevent shorting, the CVD metal oxides are stacked together, forcing the metal oxide gap layers of Sasaski to be thicker than those of the claimed invention. Consequently, the other layers of the disk drive head are proportionally thicker.

Furthermore, Moa also fails to teach or disclose "a plurality of oxidized metallic films" for reasons similar to those described above in relation to Sasaki. Consequently, Applicant respectfully asserts that Sasaki and Moa fail to teach or disclose all of the elements of claim 1, specifically, the plurality of oxidized metallic films of the gap layer.

REJECTION OF CLAIMS 10-11 UNDER 35 U.S.C. §103(a)

The Examiner rejected claims 10-11 in view of Mao, Sasaki, and Mukoyamma. This rejection is respectfully traversed. Claims 10-11 depend directly or indirectly from claim 1. Accordingly, Applicant also respectfully submits that these dependent claims are likewise patentably distinct for at least the reasons as discussed above.

REJECTION OF CLAIMS 12 UNDER 35 U.S.C. §103(a)

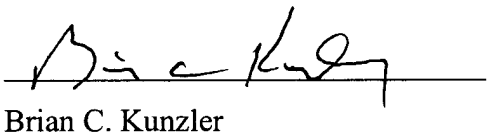
The Examiner rejected claim 12 in view of Mao, Sasaki, and Jongill. This rejection is respectfully traversed. Claim 12 recites "a first gap layer" and "a second gap layer" each "comprising a plurality of oxidized metallic films." The plurality of oxidized metallic films is the same element as is recited in claim 1. Applicant respectfully submits that Mao, Sasaki, and

Jongill fail to teach or suggest a "plurality of oxidized metallic films" as discussed above. Accordingly, Applicant submits that claim 12 is nonobvious in view of Mao, Sasaki, and Jongill.

For the reasons stated above, Applicant respectfully submits that independent claims 1 and 12 are nonobvious in view of the cited references. In addition, claims 2-11 depend directly or indirectly from claim 1. Accordingly, Applicant also respectfully submits that these dependent claims are likewise nonobvious for at least the same reasons.

In view of the foregoing, Applicant submits that the application is in condition for immediate allowance. Claims 7, 10, and 12 have been amended to satisfy informalities. In the event any questions or issues remain that can be resolved with a phone call, the Examiner is respectfully requested to initiate a telephone conference with the undersigned.

Respectfully submitted,



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